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LISTS OF SPECIES

Magnoliophyta, *restinga* vegetation, state of Ceará, Brazil

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ABSTRACT: Sandy coastal plain (*Restinga*) vegetation is composed of the plant communities that grow on Quaternary Neosols along the entire Brazilian coast. Ceará state has a coastal extension of 578 km and lies totally within the semi-arid zone of northeastern Brazil. Here we present a checklist of the phanerogamic species found along the coast of Ceará that was compiled from surveys and collections found at the EAC herbarium (Fortaleza, Ceará). A total of 391 species distributed among 208 genera and 41 families were identified. The families with the greatest numbers of species were Fabaceae senso latu (130 species), Cyperaceae (51), Poaceae (47), Rubiaceae (27), Euphorbiaceae (19), Asteraceae (13), Bignoniaceae (11) and Malvaceae (12), representing over 78.77% of the species collected.

INTRODUCTION

Restinga vegetation is composed of the communities of plants that grow on Quaternary Neosols (Suguio and Tessler 1984; Rizzini 1997; Marques *et al.* 2004). *Restingas* can have different physiognomies that vary from grasslands to shrublands or forests (Silva and Britez 2005), and they occur along the entire Brazilian coast (Oliveira-Filho 1993).

The coastal band of northeastern Brazil can be divided in two sectors: an eastern super-humid region comprising the coastal areas of the states of Bahia, Sergipe, Alagoas, Pernambuco, Paraíba and Rio Grande do Norte; and a northern semi-arid region comprising coastal areas of the states of Rio Grande do Norte, Ceará, Piauí and Maranhão (Suguio and Tessler 1984; Villwock *et al.* 2005).

Among the northeastern states, more floristic and structural studies of *restinga* ecosystems have been undertaken in Pernambuco, Bahia and Piauí, with only scattered information being available for the other states.

Ceará state has 578 km of coastline that is predominantly composed of sea cliffs of the Barreiras Formation and quaternary quartz sand deposits. *Restinga* vegetation occupying dunes and inter-dune regions can be found along the entire coast of this state.

Despite this extensive coastline, only one scientific paper (Matias and Nunes 2001) and one technical report (Matias and Silva 2001) have been published with data referring to *restinga* vegetation in Ceará. In an effort to fill this gap, we present here a checklist of the phanerogamic species registered in *restinga* areas of Ceará state, Brazil.

MATERIALS AND METHODS

Ceará state has a total territorial area of 148,825 km^2, making it the fourth largest state in northeastern Brazil (Figure 1). The coast of Ceará is 573 km long, representing 17.3% of the coast of northeastern and 7.8% of the Brazilian coast. The vegetation cover is predominantly *Caatinga*, which occurs in the "Depressão Sertaneja Setentrional" region, according to the classification proposed by Velloso *et al.* (2002). The coast of Ceará state is marked by the predominance of psammophilous vegetation (covering dunes). Cliffs are found in some regions ("Barreiras" Formation)

The species listed in this study were compiled from data available in the Prisco Bezerra Herbarium (EAC) collection at the Universidade Federal do Ceará (UFC) and from floristic surveys carried out in the Jericoacoara Environmental Protection Area (Matias and Nunes 2001; Matias and Silva 2001). All herbarium specimens were considered, including invasive species that grow in lacustrine environments and species typical of areas in contact with mangrove swamps; exotic species or those with doubtful identifications were excluded. A recent study indicated a Complexo Litorâneo phytoecological unit with the highest percentage of species collected, considering all of the EAC herbarium collection (24% species and 24% *exsiccatae*) (Freitas and Matias 2010).

The herbarium material comprises collections made in 21 coastal municipalities in Ceará state, all located on coastal plains with predominantly Quaternary Neosols.

The checklist places the genera in the family, followed by a species list. The classification system used was based on APG II (2003). Current species names and new synonyms were confirmed by consulting the MOBOT data base (2009) as well as the specialized literature for certain groups. The life forms of the species were identified based on the classification system of Whittaker (1975); information on the life forms was obtained from herbarium labels.

RESULTS AND DISCUSSION

All of the herbarium samples collected along the coast of Ceara state were examined. The final list of phanerogam species reported for *restinga* areas in Ceará state totaled 391 species, distributed among 208 genera and 41 families (Table 1). The families with the greatest numbers of species

were: Fabaceae *sensu lato* (130), Cyperaceae (51), Poaceae (47), Rubiaceae (27), Euphorbiaceae (19), Asteraceae (13), Bignoniaceae (11) and Malvaceae (10), which correspond to 78.77% of the total number of species; 41.46% of the families had only one species.

Fabaceae, Poaceae, Cyperaceae, Rubiaceae and Euphorbiaceae are the families most cited in floristic surveys in Brazilian *restingas* (Rambo, 1954; Pereira and Araújo, 2000; Kersten and Silva, 2005). A checklist prepared by Zickel *et al.* (2007) for Pernambuco state likewise noted high frequencies for the families Fabaceae (67 spp.), Poaceae (39 spp.), Cyperaceae (26 spp.) and Euphorbiaceae (25 spp.). In a recent floristic survey carried out in Piauí state that included part of the upper northeastern coast (F. S. Santos-Filho personal communication), the families Fabaceae, Poaceae, Cyperaceae and Euphorbiaceae were likewise found to have the highest number of species. These same families, together with the Orchidaceae, Bromeliaceae and Sapotaceae (Araújo and Henriques 1984; Assis *et al.* 2004; Martins *et al.* 2008) are well represented in restinga areas in southeastern Brazil.

The most representative genera in the present survey were *Cyperus* (14 spp.), *Eleocharis* (12), *Mimosa* (10), *Chamaecrista* (10), *Aeschynomene* (8), *Paspalum* (7), *Croton* (7), *Rhynchospora* (6), *Senna* (6), *Sida* (6), *Caesalpinia* (5), *Centrosema* (5) and *Fimbristylis* (5), representing 25.83% of all of the species recorded. In spite of the fact that these genera occur in many other areas of restinga, specific localities tend to have their own flora due to environmental factors that influence species composition (Barros 2009).

The species *Ipomoea asarifolia* (Desr.) Roem. and Schult., *Remirea maritima* Aubl, *Richardia grandiflora* (Cham. and Schltdl.) Steud., *Heliotropium lanceolatum* Ruiz and Pav., *Blutaparon portulacoides* (A. St.-Hil.) Mears, *Sesuvium portulacastrum* (L.) L., and *Mollugo verticillata* L. (in addition to many members of the Fabaceae, Poaceae and Cyperaceae families) are among the most common plants in the dune areas and along the coast of Ceará state (Matias and Nunes 2001). Species of the families Poaceae and Cyperaceae produce large numbers of seeds and have great capacities for adapting to and resisting adverse environments (Bove *et al.* 2003). The species composition observed reflects not only of the peculiarities of the restinga ecosystem (e.g., high salinity, low levels of soil nutrients) but also habitat degradation.

In comparisons made with other *restingas* in northeastern Brazil (Cabral-Freire and Monteiro 1994 - Maranhão; F.S. Santos-Filho personal communication – Piauí; Freire 1990; Almeida Jr. *et al.* 2006; Almeida Jr. and Zickel 2009 - Rio Grande do Norte; Carvalho and Oliveira-Filho 1993; Oliveira-Filho and Carvalho 1993; Pontes and Barbosa 2008 - Paraíba; Andrade-Lima 1951; 1960; 1979; J.R.R. Cantarelli personal communication; Leite and Andrade 2004; Sacramento *et al.* 2007; Zickel *et al.* 2007; Silva *et al.* 2008; Almeida Jr. *et al.* 2009 – Pernambuco; Esteves 1980 – Alagoas; and Pinto *et al.* 1984; Viana *et al.* 2006 - Bahia), 91% of the species listed for Ceará were also reported in other coastal areas of northeastern

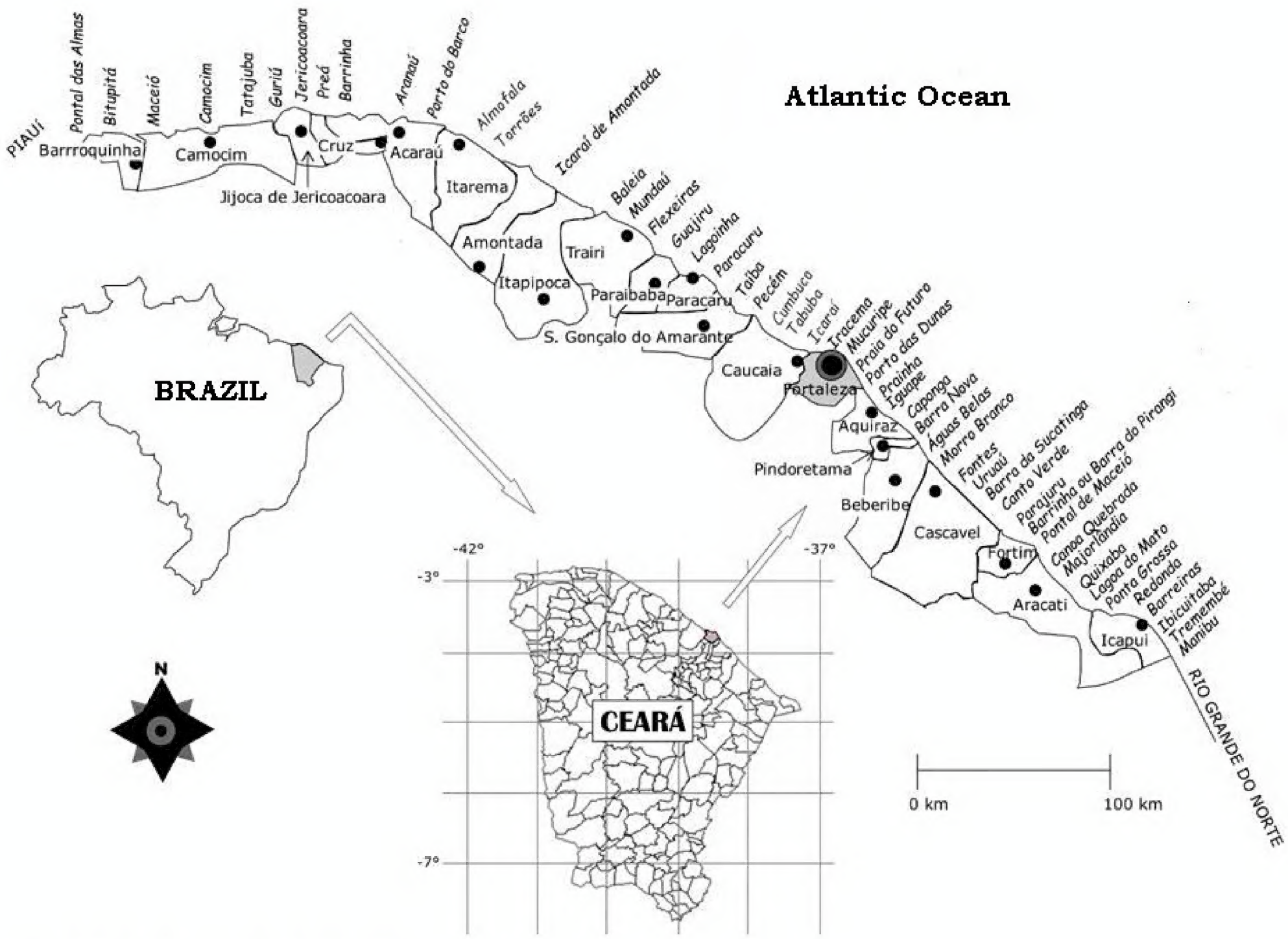

FIGURE 1. Map of the coast of the state of Ceará.

Brazil; the remaining 9% were recorded only in *restingas* in Ceará (including *Cryptostegia grandiflora* Roxb. ex R.Br., *Amaranthus viridis* L., *Pycreus macrostachyos* (Lam.) J. Raynal, *Sapium glandulatum* (L.) Morong, *Tanacetum vulgare* L. and *Tetracera willdenoviana* Steud.) (Table 1).

Our survey indicates that 46.54% of the species recorded for the coastal areas of Ceará state are herbaceous plants (Figure 2). This reflects the significant presence of pioneer species that rapidly colonize this environment (mainly dune areas typical of the Ceará coast), with low, open physiognomies of erect herbaceous species and creeping-psammophytes. The herbaceous species recorded in the present study can be found in frontal dunes or fixed dune zones along most of the Brazilian coast (Pinto *et al.*, 1984; Cordazzo and Costa, 1989).

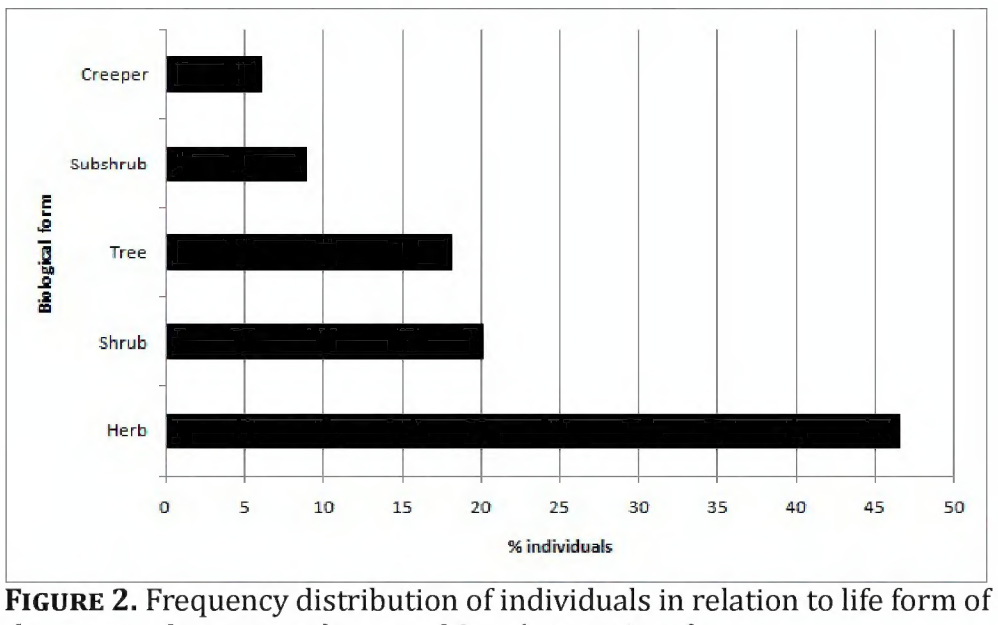

FIGURE 2. Frequency distribution of individuals in relation to life form of the species from coastal areas of Ceará state, Brazil.

FIGURE 3. Flowers and fruits of species from the restingas of Ceará state, Brazil. A - *Matelea maritima* subsp. *ganglinosa* (Vell.) Fontella; B - *Ipomoea asarifolia* (Desr.) Roem. and Schult.; C - *Cnidoscolus urens* (L.) Arthur; D - *Bowdichia virgilioides* Kunth; E - *Copaifera luetzelburgii* Harms; F - *Mimosa somnians* Humb. and Bonpl. ex Willd.; G - *Stylosanthes viscosa* (L.) Sw.; H - *Stigmaphyllon paralias* A. Juss.; I - *Ximenia americana* L.; J - *Passiflora foetida* L.; K - *Coutarea hexandra* (Jacq.) K. Schum.; L - *Lantana camara* L.

Matias and Nunes (2001) reported that woody *restinga* species occur in open or closed islands of vegetation, with a marked presence of *Chrysobalanus icaco* L., *Abrus precatorius* L. *Anacardium occidentale* L., *Byrsonima crassifolia* Kunth and *Cereus jamacaru* A. DC. The authors also noted that these woody species represent a mixture of *cerrado* and *caatinga* plants.

In general, many species observed along in this region of northeastern coast (northern coast of northeastern Brazil) are also present in the *cerrado* and *caatinga* biomes. Santos-Filho (personal communication) analyzed the restinga flora of Piauí state and, in spite of its floristic similarity with *cerrado* and *caatinga*, a significant presence of Atlantic Forest species was also noted.

The data presented here indicate the importance of herbaceous species in the physiognomic composition of beach areas. However, it is quite possible that due to their immediate proximity to the ocean the restinga areas of Ceará state have been widely altered due to human utilization for leisure and tourism. As such, conservation efforts focusing on coastal plant communities must include quantitative studies and attempt to decelerate anthropogenic impacts.

TABLE 1. List of phanerogamic species of restinga areas of the state of Ceará.

FAMILIES / SPECIES	HABIT
Acanthaceae	
Avicennia germinans (L.) L.	Tree
Avicennia schaueriana Stapf and Leechm. ex Moldenke	Tree
Aizoaceae	
Sesuvium portulacastrum (L.) L.	Herb
Amaranthaceae	
Alternanthera brasiliana (L.) Kuntze	Herb
Alternanthera littoralis P. Beauv.	Herb
Alternanthera littoralis var. *maritima* (Mart.) Pedersen	Herb
Amaranthus viridis L.	Herb
Blutaparon portulacoides (A.St.-Hil.) Mears	Herb
Froelichia humboldtiana (Roem. and Schult.) Seub.	Herb
Gomphrena demissa Mart.	Herb
Anacardiaceae	
Anacardium occidentale L.	Tree
Apocynaceae	
Allamanda blanchetii A. DC.	Shrub
Aspidosperma pyrifolium Mart.	Shrub
Calotropis procera (Aiton) W.T. Aiton	Shrub
Cryptostegia grandiflora Roxb. ex R. Br.	Shrub
Hancornia speciosa Gomes	Tree
Himatanthus drasticus (Mart.) Plumel	Tree
Matelea maritima subsp. *ganglinosa* (Vell.) Fontella (Figure 3A)	Creeper
Tabernaemontana catharinensis A.DC.	Subshrub
Araceae	
Montrichardia linifera (Arruda) Schott	Shrub
Philodendron imbe Schott ex Endl.	Shrub
Arecaceae	
Copernicia prunifera (Mill.) H.E. Moore	Tree
Asteraceae	
Acmella oleracea (L.) R.K. Jansen	Herb
Centratherum punctatum Cass.	Herb

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Delilia biflora (L.) Kuntze	Herb
Eclipta alba (L.) Hassk.	Herb
Egletes viscosa (L.) Less.	Herb
Elephantopus hirtiflorus DC.	Herb
Elephantopus mollis Kunth	Herb
Mikania micrantha Kunth	Creeper
Stilpnopappus trichospiroides Mart. ex DC.	Herb
Tanacetum vulgare L.	Herb
Tilesia baccata (L.f.) Pruski	Herb
Vernonia chalybaea Mart. ex DC.	Subshrub
Wedelia scaberrima Benth.	Herb
Bataceae	
Batis maritima L.	Subshrub
Bignoniaceae	
Adenocalymma pedunculatum (Vell.) L. Lohmann	Herb
Cuspidaria argentea (Wawra) Sandwith	Creeper
Fridericia dispar (Bureau ex K. Schum.) L. Lohmann	Creeper
Fridericia platyphylla (Cham.) L.G. Lohmann	Creeper
Fridericia subverticillata (Bureau and K. Schum.) L.G. Lohmann	Creeper
Handroanthus impetiginosus Mattos	Tree
Jacaranda brasiliana (Lam.) Pers.	Tree
Jacaranda cuspidifolia Mart.	Tree
Lundia cordata (Vell.) A. DC.	Creeper
Neojobertia candolleana (Mart. ex DC.) Bureau and K.Schum.	Creeper
Tabebuia roseoalba (Ridl.) Sandwith	Tree
Boraginaceae	
Cordia oncocalyx Allemão	Tree
Cordia rufescens A. DC.	Tree
Heliotropium polyphyllum Lehm.	Subshrub
Varronia leucomalloides (Taroda) J.S. Mill.	Tree
Varronia polycephala Lam.	Shrub
Cactaceae	
Cereus jamacaru DC.	Shrub
Capparaceae	
Capparis flexuosa (L.) L.	Shrub
Chrysobalanaceae	
Chrysobalanus icaco L.	Shrub
Hirtella ciliata Mart. and Zucc.	Shrub
Hirtella racemosa Lam.	Shrub
Combretaceae	
Conocarpus erectus L.	Shrub
Commelinaceae	
Commelina diffusa Burm.f.	Herb
Convolvulaceae	
Cuscuta racemosa Mart.	Herb
Evolvulus ovatus Fernald	Herb
Ipomoea asarifolia (Desr.) Roem. and Schult. (Figure 3B)	Creeper
Ipomoea carnea Jacq.	Shrub
Ipomoea pes-caprae (L.) R. Br.	Creeper
Jacquemontia sphaerostigma (Cav.) Rusby	Herb
Merremia aegyptia (L.) Urb.	Herb
Cyperaceae	
Bulbostylis capillaris (L.) C.B. Clarke	Herb
Bulbostylis hirta (Thunb.) Svenson	Herb
Bulbostylis junciformis (Kunth) C.B. Clarke	Herb
Bulbostylis juncoides (Vahl) Kük.	Herb
Cyperus aggregatus (Willd.) Endl.	Herb
Cyperus amabilis Vahl	Herb

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Cyperus articulatus L.	Herb
Cyperus compressus L.	Herb
Cyperus distans L.	Herb
Cyperus entrerianus Boeckeler	Herb
Cyperus hermaphroditus (Jacq.) Standl.	Herb
Cyperus iria L.	Herb
Cyperus laxus Lam.	Herb
Cyperus ligularis L.	Herb
Cyperus maritimus Poir.	Herb
Cyperus odoratus L.	Herb
Cyperus sphacelatus Rottb.	Herb
Cyperus surinamensis Rottb.	Herb
Eleocharis acutangula (Roxb.) Schult.	Herb
Eleocharis atropurpurea (Retz.) J. Presl and C. Presl	Herb
Eleocharis barrosii Svenson	Herb
Eleocharis flavescens (Poir.) Urb.	Herb
Eleocharis geniculata (L.) Roem. and Schult.	Herb
Eleocharis interstincta (Vahl) Roem. and Schult.	Herb
Eleocharis maculosa (Vahl) Roem. and Schult.	Herb
Eleocharis minima Kunth	Herb
Eleocharis montana (Kunth) Roem. and Schult.	Herb
Eleocharis mutata (L.) Roem. and Schult.	Herb
Eleocharis plicarhachis (Griseb.) Svenson	Herb
Eleocharis sellowiana Kunth	Herb
Fimbristylis complanata (Retz.) Link	Herb
Fimbristylis cymosa (Lam.) R. Br.	Herb
Fimbristylis dichotoma (L.) Vahl	Herb
Fimbristylis spadicea (L.) Vahl	Herb
Fimbristylis vahlii (Lam.) Link	Herb
Fuirena umbellata Rottb.	Herb
Kyllinga brevifolia Rottb.	Herb
Kyllinga odorata Vahl	Herb
Kyllinga squamulata Thonn. ex Vahl	Herb
Kyllinga vaginata Lam.	Herb
Pycreus fugax (Liebm.) C.D. Adams	Herb
Pycreus macrostachyos (Lam.) J.Raynal	Herb
Pycreus polystachyos (Rottb.) P.Beauv.	Herb
Remirea maritima Aubl.	Herb
Rhynchospora barbata (Vahl) Kunth	Herb
Rhynchospora caracasana (Kunth) Boeckeler	Herb
Rhynchospora contracta (Nees) J.Raynal	Herb
Rhynchospora emaciata (Nees) Boeckeler	Herb
Rhynchospora holoschoenoides (Rich.) Herter	Herb
Rhynchospora riparia (Nees) Boeckeler	Herb
Scleria latifolia Sw.	Herb
Dilleniaceae	
Curatella americana L.	Tree
Tetracera breyniana Schltdl.	Shrub
Tetracera willdenowiana Steud.	Shrub
Euphorbiaceae	
Acalypha villosa Jacq.	Herb
Astraea lobata (L.) Klotzsch	Subshrub
Chamaesyce chamaecaula (Weath.) Millsp.	Herb
Cnidoscolus urens (L.) Arthur (Figure 3C)	Shrub
Croton anisodontus Müll. Arg.	Shrub
Croton glandulosus L.	Subshrub
Croton heliotropiifolius Kunth	Shrub
Croton jacobinensis Baill.	Shrub
Croton nepetifolius Baill.	Shrub
Croton pedicellatus Kunth	Subshrub

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Croton sonderianus Müll. Arg.	Shrub
Dalechampia pernambucensis Baill.	Creeper
Dalechampia scandens L.	Herb
Euphorbia heterophylla L.	Herb
Euphorbia hyssopifolia L.	Herb
Euphorbia prostrata Aiton	Herb
Microstachys corniculata (Vahl) Griseb.	Herb
Sapium glandulosum (L.) Morong	Tree
Sebastiania brasiliensis Spreng.	Herb
Fabaceae	
Abrus precatorius L.	Creeper
Aeschynomene brevipes Benth.	Subshrub
Aeschynomene evenia C. Wright ex Sauvalle	Subshrub
Aeschynomene filosa Mart.	Shrub
Aeschynomene histrix Poir.	Herb
Aeschynomene marginata Benth.	Herb
Aeschynomene rudis Benth.	Subshrub
Aeschynomene sensitiva Sw.	Shrub
Aeschynomene viscidula Michx.	Subshrub
Albizia inundata (Mart.) Barneby and J.W.Grimes	Tree
Amburana cearensis (Allemão) A.C.Sm.	Tree
Anadenanthera colubrina (Vell.) Brenan	Tree
Andira humilis Mart. ex Benth.	Tree
Andira surinamensis (Bondt) Splitg. ex Amshoff	Tree
Apuleia leiocarpa (Vogel) J.F.Macbr.	Tree
Bauhinia dubia G. Don	Shrub
Bauhinia pentandra (Bong.) Vogel ex Steud.	Shrub
Bauhinia ungulata L.	Shrub
Bowdichia virgilioides Kunth (Figure 3D)	Tree
Caesalpinia bracteosa Tul.	Tree
Caesalpinia echinata Lam.	Tree
Caesalpinia ferrea Mart.	Tree
Caesalpinia pulcherrima (L.) Sw.	Shrub
Caesalpinia pyramidalis Tul.	Shrub
Calliandra depauperata Benth.	Subshrub
Calliandra sessilis Benth.	Tree
Calliandra spinosa Ducke	Shrub
Calopogonium caeruleum (Benth.) C. Wright	Tree
Calopogonium mucunoides Desv.	Creeper
Canavalia brasiliensis Mart. ex Benth.	Herb
Canavalia rosea (Sw.) DC.	Herb
Cassia grandis L. f.	Tree
Centrosema brasilianum (L.) Benth.	Creeper
Centrosema pascuorum Mart. ex Benth.	Herb
Centrosema rotundifolium Mart. ex Benth.	Creeper
Centrosema sagittatum (Humb. and Bonpl. ex Willd.) Brandegee	Herb
Centrosema virginianum (L.) Benth.	Creeper
Chamaecrista calycioides (DC. ex Collad.) Greene	Herb
Chamaecrista desvauxii (Collad.) Killip	Herb
Chamaecrista diphylla (L.) Greene	Subshrub
Chamaecrista ensiformis (Vell.) H.S. Irwin and Barneby	Tree
Chamaecrista flexuosa (L.) Greene	Subshrub
Chamaecrista hispidula (Vahl) H.S. Irwin and Barneby	Herb
Chamaecrista ramosa (Vogel) H.S. Irwin and Barneby	Herb
Chamaecrista rotundifolia (Pers.) Greene	Subshrub
Chamaecrista supplex (Mart. ex Benth.) Britton and Rose ex Britton and Killip	Herb

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Chamaecrista trichopoda (Benth.) Britton and Rose ex Britton and Killip	Herb
Chloroleucon acacioides (Ducke) Barneby and J.W. Grimes	Tree
Clitoria fairchildiana R.A. Howard	Tree
Clitoria laurifolia Poir.	Shrub
Copaifera arenicola (Ducke) J.Costa and L.P.Queiroz	Tree
Copaifera luetzelburgii Harms (Figure 3E)	Shrub
Cratylia argentea (Desv.) Kuntze	Shrub
Crotalaria incana L.	Herb
Crotalaria pallida Aiton	Herb
Crotalaria retusa L.	Shrub
Crotalaria stipularia Desv.	Herb
Dalbergia cearensis Ducke	Shrub
Dalbergia ecastaphyllum (L.) Taub.	Shrub
Dalbergia frutescens (Vell.) Britton	Tree
Desmodium barbatum (L.) Benth.	Herb
Desmodium triflorum (L.) DC.	Herb
Dioclea lasiophylla Mart. ex Benth.	Subshrub
Dioclea sclerocarpa Ducke	Creeper
Dioclea violacea Mart. ex Benth.	Shrub
Enterolobium contortisiliquum (Vell.) Morong	Tree
Galactia striata (Jacq.) Urb.	Creeper
Geoffroea spinosa Jacq.	Tree
Guilandina bonduc L.	Shrub
Hymenaea courbaril L.	Tree
Hymenaea martiana Hayne	Shrub
Indigofera hirsuta L.	Shrub
Indigofera microcarpa Desv.	Subshrub
Indigofera suffruticosa Mill.	Shrub
Inga ingoides (Rich.) Willd.	Tree
Inga vera Willd.	Tree
Leptolobium dasycarpum Vogel	Tree
Leptolobium parvifolium (Harms) Sch.Rodr. and A.M.G. Azevedo	Tree
Lonchocarpus araripensis Benth.	Tree
Luetzelburgia auriculata (Allemão) Ducke	Tree
Macroptilium lathyroides (L.) Urb.	Subshrub
Macroptilium panduratum (Mart. ex Benth.) Maréchal and Baudet	Herb
Mimosa acutistipula (Mart.) Benth.	Tree
Mimosa arenosa (Willd.) Poir.	Tree
Mimosa caesalpiniifolia Benth.	Shrub
Mimosa camporum Benth.	Shrub
Mimosa hirsutissima Mart.	Shrub
Mimosa misera Benth.	Subshrub
Mimosa paraibana Barneby	Shrub
Mimosa pigra L.	Shrub
Mimosa somnians Humb. and Bonpl. ex Willd. (Figure 3F)	Subshrub
Mimosa tenuiflora (Willd.) Poir.	Shrub
Mucuna sloanei Fawc. and Rendle	Herb
Neptunia oleracea Lour.	Subshrub
Neptunia plena (L.) Benth.	Subshrub
Parkinsonia aculeata L.	Tree
Piptadenia stipulacea (Benth.) Ducke	Shrub
Piptadenia viridiflora (Kunth) Benth.	Shrub
Pithecellobium diversifolium Benth.	Shrub
Pithecellobium dulce (Roxb.) Benth.	Tree
Pityrocarpa moniliformis (Benth.) Luckow and R.W.Jobson	Shrub

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Plathymenia reticulata Benth.	Tree
Platymiscium floribundum Vogel	Tree
Poeppigia procera C. Presl	Tree
Pterogyne nitens Tul.	Tree
Rhynchosia phaseoloides (Sw.) DC.	Creeper
Senegalia polyphylla (DC.) Britton and Rose	Tree
Senna alata (L.) Roxb.	Shrub
Senna macranthera (DC. ex Collad.) H.S. Irwin and Barneby	Tree
Senna obtusifolia (L.) H.S. Irwin and Barneby	Herb
Senna occidentalis (L.) Link	Herb
Senna rizzinii H.S. Irwin and Barneby	Tree
Senna splendida (Vogel) H.S. Irwin and Barneby	Shrub
Sesbania exasperata Kunth	Shrub
Sophora tomentosa L.	Shrub
Stryphnodendron coriaceum Benth.	Tree
Stylosanthes angustifolia Vogel	Subshrub
Stylosanthes capitata Vogel	Subshrub
Stylosanthes scabra Vogel	Subshrub
Stylosanthes viscosa (L.) Sw. (Figure 3G)	Subshrub
Tephrosia cinerea (L.) Pers.	Subshrub
Tephrosia egregia Sandwith	Shrub
Trischidium molle (Benth.) H.E.Ireland	Shrub
Vachellia farnesiana (L.) Wight an Arn.	Shrub
Vatairea macrocarpa (Benth.) Ducke	Tree
Vigna peduncularis (Kunth) Fawc. and Rendle	Creeper
Zapoteca portoricensis Jacq.	Subshrub
Zornia cearensis Huber	Herb
Zornia latifolia Sm.	Herb
Zornia orbiculata Mohlenbr.	Herb
Lamiaceae	
Aegiphila verticillata Vell.	Shrub
Marsypianthes chamaedrys (Vahl) Kuntze	Herb
Vitex flavens Kunth	Tree
Lythraceae	
Cuphea campestris Koehne	Herb
Malpighiaceae	
Byrsonima crassifolia (L.) Kunth	Shrub
Byrsonima gardneriana A. Juss.	Tree
Byrsonima sericea DC.	Tree
Byrsonima verbascifolia (L.) DC.	Shrub
Stigmaphyllon bannisterioides (L.) C.E. Anderson	Herb
Stigmaphyllon paralias A. Juss. (Figure 3H)	Subshrub
Malvaceae	
Luehea candicans Mart. and Zucc.	Tree
Pavonia cancellata (L.) Cav.	Herb
Pavonia varians Moric.	Herb
Peltaea trinervis (C. Presl) Krapov.Cristóbal.	Subshrub
Sida angustissima Miq.	Herb
Sida ciliaris L.	Herb
Sida galheirensis Ulbr.	Herb
Sida glomerata Cav.	Herb
Sida rhombifolia L.	Subshrub
Sida tuberculata R.E.Fr.	Herb
Melastomataceae	
Mouriri cearensis Huber	Tree
Mouriri guianensis Aubl.	Tree
Molluginaceae	
Mollugo verticillata L.	Herb
Moraceae	

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Maclura tinctoria (L.) D. Don ex Steud.	Tree
Myrtaceae	
Eugenia luschnathiana (O. Berg) Klotzsch ex. B. D. Jacks.	Shrub
Eugenia tapacumensis O. Berg	Shrub
Myrcia guianensis (Aubl.) DC.	Shrub
Myrcia multiflora (Lam.) DC.	Tree
Psidium guyanense Pers.	Shrub
Olacaceae	
Ximenia americana L. (Figure 3I)	Shrub
Passifloraceae	
Passiflora cincinnata Mast.	Creeper
Passiflora foetida L. (Figure 3J)	Creeper
Passiflora subrotunda Mast.	Creeper
Phyllanthaceae	
Phyllanthus tenellus Roxb.	Herb
Poaceae	
Andropogon bicornis L.	Herb
Andropogon fastigiatus Sw.	Herb
Andropogon leucostachyus Kunth	Herb
Andropogon selloanus (Hack.) Hack	Herb
Anthephora hermaphrodita (L.) Kuntze	Herb
Aristida adscensionis L.	Herb
Aristida longifolia Trin.	Herb
Aristida setifolia Kunth	Herb
Axonopus capillaris (Lam.) Chase	Herb
Axonopus marginatus (Trin.) Chase	Herb
Cenchrus ciliaris L.	Herb
Cenchrus echinatus L.	Herb
Chaetium festucoides Nees	Herb
Chloris barbata Sw.	Herb
Chloris virgata Sw.	Herb
Cyphonanthus discrepans (Döll) Zuloaga and Morrone	Herb
Dactyloctenium aegyptium (L.) Willd.	Herb
Dichanthelium sciurotis (Trin.) Davidse	Herb
Digitaria aequiglumis (Hack. and Arechav.) Parodi	Herb
Digitaria ciliaris (Retz.) Koeler	Herb
Digitaria horizontalis Willd.	Herb
Eleusine indica (L.) Gaertn.	Herb
Eragrostis ciliaris (L.) R. Br.	Herb
Eragrostis maypurensis (Kunth) Steud.	Herb
Eragrostis rufescens Schrad. ex Schult.	Herb
Eragrostis scaligera Salzm. ex Steud.	Herb
Eriochloa polystachya Kunth	Herb
Eriochloa punctata (L.) Desv. ex Ham.	Herb
Gymnopogon foliosus (Willd.) Nees	Herb
Ischaemum rugosum Salisb.	Herb
Mesosetum loliiforme (Hochst. *ex* Steud.) Chase	Herb
Mesosetum pappophorum (Nees) Kuhlm.	Herb
Oplismenus burmannii (Retz.) P. Beauv.	Herb
Panicum aquaticum Poir.	Herb
Panicum trichoides Sw.	Herb
Paspalidium geminatum (Forssk.) Stapf	Herb
Paspalum clavuliferum C. Wright	Herb
Paspalum convexum Humb. and Bonpl. *ex* Flüggé	Herb
Paspalum densum Poir.	Herb
Paspalum maritimum Trin.	Herb
Paspalum pleostachyum Döll	Herb
Paspalum scutatum Nees ex Trin.	Herb
Paspalum vaginatum Sw.	Herb
Sporobolus virginicus (L.) Kunth	Herb

Table 1. ***Continued.***

FAMILIES / SPECIES	HABIT
Steirachne diandra Ekman	Herb
Urochloa plantaginea (Link) R.D. Webster	Herb
Polygalaceae	
Polygala gracilis Kunth	Herb
Rhamnaceae	
Ziziphus joazeiro Mart.	Tree
Rubiaceae	
Alibertia rigida K.Schum.	Subshrub
Alibertia edulis (Rich.) A. Rich. ex DC.	Shrub
Alseis floribunda Schott	Tree
Borreria ocymoides (Burm.f.) DC.	Herb
Borreria latifolia (Aubl.) K.Schum.	Herb
Borreria scabiosoides Cham. and Schltdl.	Herb
Borreria verticillata (L.) G.Mey.	Herb
Chiococca alba (L.) Hitchc.	Shrub
Chiococca nitida Benth.	Shrub
Chomelia martiana Müll. Arg.	Tree
Chomelia obtusa Cham. and Schltdl.	Shrub
Coutarea hexandra (Jacq.) K. Schum. (Figure 3K).	Shrub
Diodella apiculata (Willd. ex Roem. and Schult.) Delprete	Herb
Diodella radula (Willd. ex Roem. and Schult.) Delprete	Herb
Diodella teres (Walter) Small	Herb
Faramea nitida Benth.	Shrub
Genipa americana L.	Tree
Guettarda platypoda DC.	Shrub
Guettarda viburnoides Cham. and Schltdl.	Shrub
Machaonia brasiliensis (Hoffmanns. ex Humb.) Cham. and Schltdl.	Shrub
Manettia cordifolia Mart.	Creeper
Margaritopsis carrascoana (Delprete and E.B.Souza) C.M.Taylor and E.B.Souza	Subshrub
Mitracarpus frigidus (Willd. ex Roem. and Schult.) K. Schum.	Herb
Randia armata (Sw.) DC.	Shrub
Richardia grandiflora (Cham. and Schltdl.) Steud.	Herb
Staelia galioides DC.	Subshrub
Tocoyena sellowiana (Cham. and Schltdl.) k. Schum.	Tree
Sapotaceae	
Chrysophyllum arenarium Allemão	Tree
Manilkara salzmannii (A. DC.) H. J. Lam	Tree
Manilkara triflora (Allemão) Monach.	Shrub
Pouteria reticulata (Engl.) Eyma	Tree
Solanaceae	
Solanum paludosum Moric.	Shrub
Turneraceae	
Turnera calyptrocarpa Urb.	Herb
Turnera diffusa Willd. ex Schult.	Herb
Turnera melochioides Cambess	Herb
Turnera subulata Sm.	Herb
Verbenaceae	
Lantana camara L. (Figure 3L)	Shrub
Lippia alba (Mill.) N.E. Br.	Herb
Stachytarpheta cayennensis (Rich.) Vahl	Subshrub
Violaceae	
Hybanthus calceolaria (L.) Oken	Herb

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